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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/884,720	06/19/2001	Richard R. Hengst	6096-01	2520
26614	7590	10/06/2005	EXAMINER	
PEPE & HAZARD, LLP 225 ASYLUM ST. HARTFORD, CT 06103			KACKAR, RAM N	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 10/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/884,720

Applicant(s)

HENGST, RICHARD R.

Examiner

Ram N. Kackar

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 July 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-4, 6, 9, 11-27, 29, 30 and 32 is/are pending in the application.
- 4a) Of the above claim(s) 17-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6, 9, 11-16, 29, 30 and 32 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 9/9/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 1-4, 6, 11-15, 29-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Richard R Hengst (US 5931666) in view of Lu et al (US 5904778) as evidenced by Breidenbach et al (US 5562774) and Hotate et al (US 5448418).**

Hengst discloses a vertical wafer boat with plurality of support rods for supporting plurality of silicon wafers having ceramic body of siliconized SiC (Col 5 line 42-45), having ceramic coating of SiC to prevent migration of impurities (Col 5 line 32-45) and surface roughness (finish) Ra to prevent slip of less than 1  $\mu\text{m}$  (Col 4 lines 14-22), horizontal base, top plate, support rods, plurality of slots, each having ceramic coating and surface finish (Fig 1).

Hengst discloses ceramic coating of silicon carbide but do not disclose its thickness.

Lu et al disclose that protective SiC coating of 100 $\mu\text{m}$  or less were well known (Col 6 line 21-23). Hotate et al, incorporated by Lu et al (Lu et al - Col 6 line 17) teaches that too thick coating of CVD-SiC on SiC base may develop defects due to occlusion of particles (Hotate et al - Col 1 lines 20-25). Hotate et al further teach that coatings 30-300 micron are preferable (Col 2 lines 8-13).

Art Unit: 1763

While Hotate et al teach the desirability of having the film thin in the context of the particular situation of SiC film over SiC, it is well known in general that thick films compared to thin films may have less adhesion. Breidenbach et al teach (Col 1 lines 12-16) that thicker films flake off easily. This observation is known and documented extensively in the art.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have a thickness of less than 100 microns because too thick a layer may have problems due to a tendency to peel and acquire other defects and too thin layer may not provide adequate protection.

**3. Claims 1-4, 6, 9, 11-15, 29-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Inaba et al (JP 11016993) which later became (US Patent 6093644) in view of Lu et al (US 5904778).**

Inaba et al disclose a vertical wafer boat for supporting silicon wafers having ceramic body (Fig 1 and Col 1 line 34) having ceramic coating to prevent migration of impurities (Col 1 line 20) and surface finish over the coating to prevent slip in substrates of large diameters (Col 1 line 20) and at high temperature (Col 1 line 13), maximum roughness of the finish less than 10  $\mu\text{m}$  and an impurity of less than 0.1 ppm (Col 3 line 14 and 15), horizontal base (Fig 1-13), top plate (Fig 1-12), support rods (Fig 1-11) and plurality of slots (Fig -14), each having ceramic coating and surface finish (Col 2 line 47). Inaba et al disclose that the ceramic body could be Si-SiC (Col 4 lines 24-27)

Inaba et al disclose ceramic coating of silicon carbide but do not disclose its thickness.

Lu et al disclose SiC coating on sintered Silicon carbide being 100 $\mu\text{m}$  or less (Col 6 line 21-23).

Art Unit: 1763

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have a thickness of less than 100 microns because too thick a layer may have problems due to a tendency to peel and acquire other defects and too thin layer may not provide adequate protection.

**4. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Inaba et al (JP 11016993) in view of Lu et al (US 5904778) as applied to claims 12 or Richard R Hengst (US 5931666) in view of Lu et al (US 5904778) as applied to claims 12 and further in view of Larry S Wingo (US 6171400).**

Inaba et al or Richard R Hengst both, disclose a vertical wafer boat for supporting silicon wafers having ceramic body but do not disclose a stress relief slot and location notch.

Wingo discloses wafer boat having both stress relief slot and notches at the base (Fig 1).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to use the teaching of Wingo so in order to avoid problems due to thermal expansion and be able to place the boat correctly on processing platform.

#### ***Response to Amendment***

Applicant's arguments filed 7/25/2005 have been fully considered but they are not persuasive.

Applicants argue that the reasoning adopted by the PTO to support the combination of references is not supported by the references of record, and the references of record fail to provide any other sound technical basis to combine features of a surface finish Ra less than or

Art Unit: 1763

substantially equal to 1.0 micron and ceramic coating thickness greater than or equal to 30 microns.

Examiner disagrees.

As discussed above Richard Hengst discloses the advantages of reduced surface roughness and coating of silicon carbide in the prior art. Proper motivation has been provided to combine prior art of Lu et al regarding specific thickness claimed.

Applicant while agreeing that silicon carbide coatings of a wide variety of thickness are well known in various art areas, further argues that the reference of Hotate et al is specifically limited to an optical device and is of limited significance within the field of Hengst.

Hotate et al is directed to CVD SiC coating on SiC which is later polished smooth and discloses that a layer less than 30 micron may not completely cover the base (Col 2 lines 7-12). The endeavor in Hotate is precisely that of the invention.

It has been held that art is analogous when it solves the same problem as applicant. *In re Melin* 165 USPQ 168 (CCPA 1970). Further art may be outside applicant's field of endeavor and still be analogous if both fields share the same common problem. *In re Nilssen* 7 USPQ 2d 1500 (Fed. Cir. 1988).

Applicant further argues that the disclosure of Breidenbach et al is even less relevant since the coatings taught by Breidenbach et al are on dissimilar substrate (being quartz).

This is not correct since the problem of flaking may not be limited to dissimilar materials. In the cited art of Breidenbach et al the coating of silicon oxide is on same material of quartz.

Art Unit: 1763

Applicant further argues that the disclosure of Inaba et al is generally no more relevant than the disclosure of Hengst and states that Inaba et al teach the surface finish in terms of Rmax (maximum) and not Ra (average).

Regarding Inaba et al, Ra (average) will be smaller than Rmax. When Inaba discloses maximum surface roughness less than 10  $\mu\text{m}$  the average surface roughness will be much smaller.

Further in view of the known advantage of smooth surface for prevention of slip it would be obvious to have as smooth a surface as practically possible and economical.

### ***Conclusion***

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Art Unit: 1763

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ram N. Kackar whose telephone number is 571 272 1436. The examiner can normally be reached on M-F 8:00 A.M to 5:P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571 272 1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Ram Kackar  
Examiner AU 1763